Simpson

INSTRUMENTS THAT STAY ACCURATE

260 Add-A-Tester Adapter

OPERATOR'S MANUAL

TRANSISTOR TESTER MODEL 650

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie St., Chicago 44, Illinois, ES 9-1121

In Canada, Bach-Simpson, Ltd., London, Ontario

New SIMPSON 260 "Add-A-Tester" Line

TRANSISTOR TESTER, Model 650..... $26.95
Beta Ranges: 0-10, 0-50, 0-250, (F.S.)
Beta Accuracy: ±3%, with 260 ±5% nominal
Ico Range: 0-100 ua
Ico Accuracy: ±1%, with 260 ±3% (F.S.)

DC VTVM, Model 651..... $32.95
Voltage Ranges: 0-.5/1.0/2.5/5.0/10/25/50/100/250/500
Accuracy: ±1%, with 260 ±3% (F.S.)
Input Impedance: greater than 10 megs all ranges

TEMPERATURE TESTER, Model 652... $38.95
Temperature Ranges: −50°F to +100°F, +100°F to +250°F
Accuracy: with 260 ±2° (nominal)
Three lead positions provided
Sensing Element: thermistor

AC AMMETER, Model 653..... $18.95
Ranges: 0-0.25/1/2.5/12.5/25 amps
Accuracy: ±1%, with 260 ±3% nominal
Frequency Range: 50 cycles to 3000 cycles

AUDIO WATTMETER, Model 654..... $18.95
Load Ranges: 4,8,16,600 ohms
Wattage: Continuous 25 watts (8,600 ohms)
50 watts (4,16 ohms)
Intermittent 50 watts (8,600 ohms)
100 watts (4,16 ohms)
Accuracy: ±5%, with 260 ±10% nominal
Direct reading scale from 17 microwatts to 100 watts

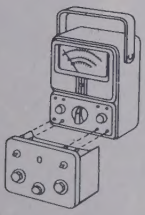
MICROVOLT ATTENUATOR, Model 655. $18.95
Ranges: 2.5 microvolts to 250,000 microvolts continuously variable in decade steps
Frequency: DC to 20 KC
Accuracy: ±1db

BATTERY TESTER, Model 656..... $19.95
Checks all radio and hearing aid batteries up to 90 volts at the manufacturer's recommended load, or any external load.

Note: All Simpson 260 Adapters provide for normal 260 usage without disconnecting the adapter.

OPERATOR'S MANUAL

TRANSISTOR TESTER MODEL 650



Just plug it in

SIMPSON ELECTRIC COMPANY

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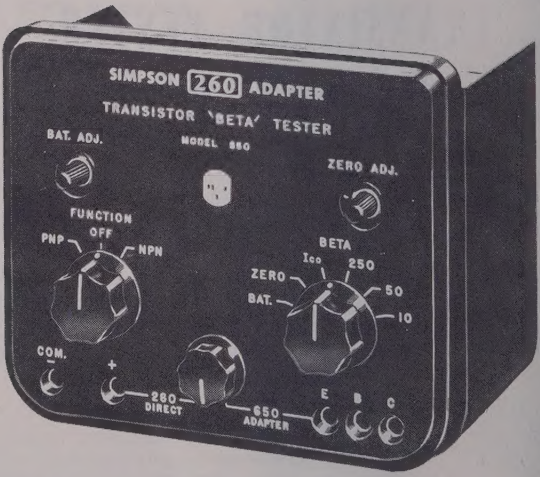


FIGURE 1 – SIMPSON MODEL 650 – ADAPTER

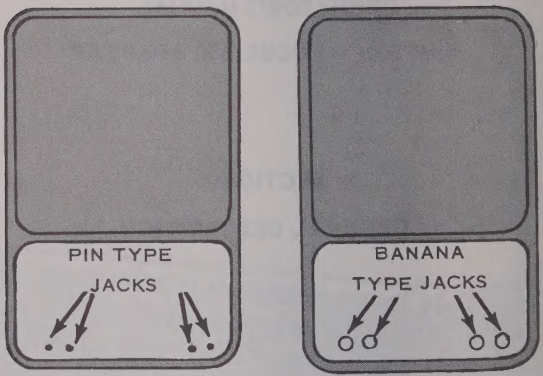
OPERATOR'S MANUAL
SIMPSON – MODEL 650 ADAPTER

SECTION I
GENERAL DESCRIPTION

INTRODUCTION

The Simpson Transistor Beta Tester Model 650 is a compact, self powered, high accuracy transistor tester. In conjunction with a Simpson Model 260 or Model 270 Volt-Ohm-Milliammeter, low and medium power transistors of the junction type can be checked directly for Beta and Ico with an accuracy heretofore found only in laboratory types of instruments. This Simpson VOM-plus-Adapter concept is completely unique in approach and provides utmost versatility.

Each of the Adapter models, of which the Transistor Tester is but one example, provides specific measurement and testing capabilities at a fraction of the cost normally required for separate testers.



(a) Model 260, series II (b) Model 260, series III

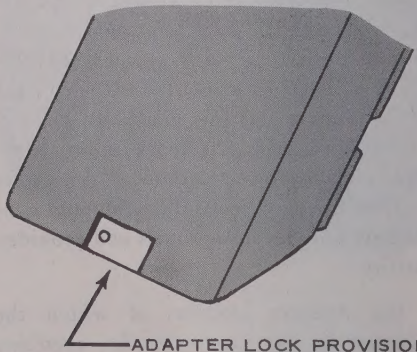


FIGURE 2 – MODEL 260 SERIES IDENTIFICATION

ACCESSORIES FURNISHED

Each instrument is furnished with an Operator's Manual, one green test lead, and four extra pin-type plugs. The green test lead is used with the two leads furnished with the VOM when it is inconvenient to insert the transistor into the Model 650 socket. The four pin-type plugs are used only when the Model 650 is to be used with the Model 260 Series II (see figure 2 for Model 260 Series II and Series III identification).

SPECIFICATIONS

Ranges:

Beta: - 0-10/50/250

Ico : - 0-100 microamperes

Accuracy:

Beta: Adapter only: ±3%
Adapter with Model 260: ±5% F.S. (nom.)
Adapter with Model 270: ±4% F.S. (nom.)

Ico : Adapter only: ±1%
Adapter plus Model 260: ±3% F.S.
Adapter plus Model 270: ±2% F.S.

Transistor Types

The Model 650 tests the general purpose types directly; i.e., the low and medium power junction type germanium transistors. Junction silicon and power transistors can be checked indirectly. Refer to Operating Instructions on page 13.

Power Requirements

Self-powered by two 1.5 volt size "D" dry cells.

Size

5-5/16" by 4-3/8" by 3-7/16".

Weight

12 oz.

MODIFICATION KITS

Kit No. 401 for Model 260 Series III and Model 270.

Use of this kit is optional. The kit converts the Model 260 Series III or the Model 270 VOM produced prior to June 1, 1959. It consists of a modified case which permits latching the Model 650 securely to the underside of the multitester.

Kit No. 402 for Model 260 Series II.

This kit is required for conversion of a Simpson Model 260 Series II to electrically accomodate the Model 650. It includes instructions and parts necessary for the conversion, and provides a 50 microampere D.C. range in the instrument.

FUNCTION OF CONTROLS

FUNCTION SWITCH

The FUNCTION switch is the large control

on the left. It has three positions marked PNP–OFF–NPN. It selects the proper battery polarity and transistor connections for checking either an NPN or a PNP type transistor. The battery is disconnected when the switch is in the OFF position to prolong battery life while the Model 650 is not being used.

BETA SWITCH

The large control on the right is the BETA switch. It has six positions for selecting the circuitry necessary for setting up the instrument for transistor measurements.

260 – 650 SWITCH

The small control at the bottom center of the front panel is a convenience switch. It permits use of the Multimeter alone without detaching the Model 650.

BATTERY–ADJUST CONTROL

This control is located at the top left on the front panel. It is adjusted for the correct voltage necessary for optimum accuracy.

ZERO ADJUST CONTROL

This control is a combination potentiometer and push-pull switch located at the right side on

the front panel. The potentiometer is adjusted for a ZERO reading, which indicates a balanced condition of the bridge circuit when the collector current is 1.0 milliampere. The switch extends the ZERO ADJ. range by shorting or connecting a resistor in series with the potentiometer.

TRANSISTOR TEST SOCKET

The socket at the top center on the front panel is the transistor test socket. Before inserting the transistor to be tested, be certain the emitter, base and collector of the transistor are properly identified. The emitter is inserted into the jack on the left side, the base is inserted into the adjacent jack, and the collector is inserted into the jack on the right side. There is no connection to the bottom jack of the transistor test socket.

E – B – C JACKS

Three jacks are located at the bottom right side on the front panel, labeled E, B, and C.

In some instances, it may be convenient to insert a transistor with long leads into the transistor test socket. Thus, the terminals of the transistor test socket are also connected to the three jacks marked E, B, and C for the emitter, base, and collector respectively.

The jacks permit use of test leads for easier connection to a transistor with long leads.

SECTION II

OPERATING INSTRUCTIONS

1. Initial Adjustments

a. Model 260/270 control settings (see fig. 3).

1. With the Model 650 disconnected, check the meter pointer position for zero indication in its operating position. If the pointer is off zero, refer to VOM instruction manual.

2. Set the Model 260/270 polarity switch to the +DC position.

3. Set the Model 260/270 range switch to the 50V/50 μA position.

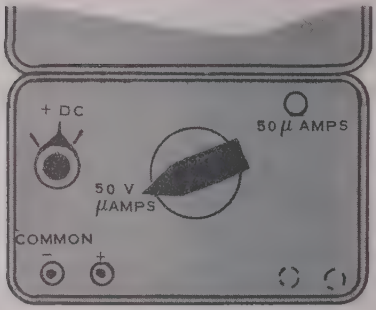
b. Model 650 Control Settings.

1. Place the FUNCTION switch in the OFF position.

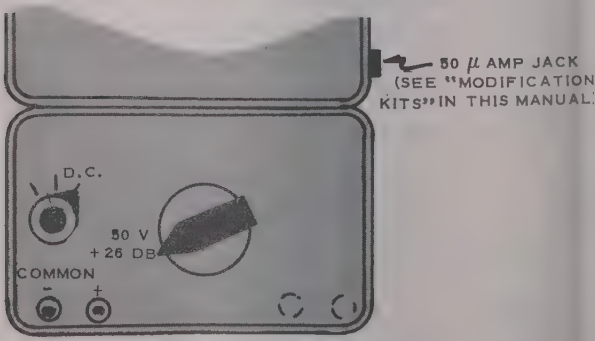
2. Place the BETA switch in the BAT. position.

3. Set ZERO ADJ. push-pull switch in its PUSH position.

4. Rotate the ZERO ADJ. control maximum counterclockwise.



(a) Model 260, series III control positions and jack used for use with Model 650.



(b) **Modified** Model 260, series II control positions and jack used for use with Model 650.

FIGURE 3 – MODEL 260 CONTROL POSITIONS FOR USE WITH MODEL 650.

NOTE

The ZERO ADJ. control is a combination potentiometer and push-pull switch. In the PUSH position, R14 is shorted. Refer to the Overall Schematic Diagram, figure 6.

c. Connecting the Model 650 to the VOM.

1. Insert the top four plugs of the Model 650 into the lower four jacks of the Model 260/270.

2. Insert the short lead from the Model 650 into the 50 μAMPS jack.

3. Position the adapter locking latch, underneath the instrument to secure the two units.

CAUTION

If your Model 260/270 case does not have the locking provision, avoid applying excessive pressure to the top of the Adapter when connected to the Multimeter. A modification kit which includes a new case with an adapter locking provision is recommended for optimum rigidity (see page 4).

2. Measuring Ico and Beta.

a. Low and medium power germanium transistors.

1. Insert the transistor to be tested into the transistor test socket. Be sure the transistor is inserted correctly (see figure 4).

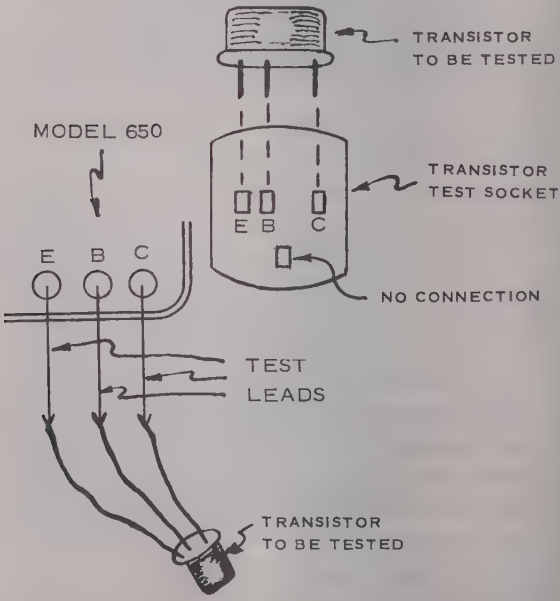


FIGURE 4 – TRANSISTOR TEST CONNECTIONS
E = emitter, B = base, C = collector

NOTE

If the transistor has long leads, it may be more convenient to use test leads and the three jacks marked E, B, and C (see figure 4).

2. Set the FUNCTION switch to the position corresponding to the type transistor being tested. The meter pointer will move near mid-scale.

3. Adjust the BAT. ADJ. control for an exact mid-scale indication; i.e., a meter reading of 25 on the 0-50 D.C. scale.

NOTE

If the pointer cannot be positioned to mid-scale, check for weak batteries.

4. Set the BETA switch to the ZERO position.

5. Allow a few minutes for the transistor to temperature-stabilize.

6. Rotate the ZERO ADJ. control for a zero indication on the 0-50 D.C. scale. If the meter cannot be made to zero, set the ZERO ADJ. push-pull switch in its PULL position and repeat the zero adjustment.

NOTE

If the meter still cannot be made to zero;

a. Check the FUNCTION switch for the correct transistor type setting.
b. Check for correct socket insertion or lead connections to transistor.
c. The transistor may have high leakage and should be checked as a power transistor.
d. The transistor is faulty.

7. Set the BETA switch to the Ico position.

8. Read the 0-10 scale and multiply by 10 for the amount of leakage in microamperes (100 μ amps F.S.). Compare this reading with the normal Ico specification from a transistor manual or a manufacturer's data sheet. It should be approximately equal to that or less.

9. Set the BETA switch to the 250, 50, or 10 range (whichever produces the most satisfactory deflection). The meter will indicate Beta directly on the corresponding range selected. Compare this reading with the value specified in a transistor manual or manufacturer's data sheet.

b. Silicon Transistors.

For silicon transistors, use the procedure

outlined in step 2(a) except multiply Beta readings by 1.16.

c. Power Transistors Beta.

Because of the high Ico in power transistors, it is sometimes not possible to zero the meter with the ZERO ADJ. control. A low level indication of Beta may be obtained as follows:

1. Set the ZERO ADJ. for the lowest convenient reading on the meter. Record this reading.

2. Set the BETA switch to 250. Record this reading.

3. Subtract the reading of Step 1 from Step 2; the difference will be the Beta for the transistor.

d. Power Transistors Ico.

If the Ico is greater than 100 μamps, proceed as follows:

1. Set the Model 260/270 range switch to the 1 or 10 MA position.

2. Read the Ico on the corresponding scale.

SECTION III

THEORY OF OPERATION

BETA MEASUREMENT

Basically, the Model 650 consists of a bridge circuit in which balance occurs when the collector current is 1 milliampere. The ZERO ADJ. control adjusts the base current to achieve this 1 ma. of collector current. At this point the meter current is zero.

When the BETA range switch is in the 250, 50, or 10 position, a pre-determined change of base current is then switched into the circuit. The resulting bridge unbalance yields a meter deflection which directly corresponds to Beta. Beta is defined as

$$\frac{\Delta I_C}{\Delta I_B}$$

with E_{CE} constant. Despite its simplicity, the Beta measuring circuit in the Model 650 is unique and technically dependable (Patent Pending).

Ico

When the BETA switch is in the Ico position, the emitter is opened and the meter is connected to measure the collector current, Ico.

APPLICATIONS

The accuracy of measurement possible with the Model 650 enables the instrument to be used for many applications beyond the "good-doubtful-bad" category. Some of these are:

Transistor matching.
Transistor gain selection.
Testing for incoming inspection.
Transistor circuitry design.
Production analyzing.

SECTION IV

MAINTENANCE

CASE REMOVAL

To remove the instrument from the case, remove the four screws located in the four corners on the back of the instrument case. All the components are attached to the front panel. Be sure the instrument is detached from the Multimeter and test leads are removed.

BATTERY REPLACEMENT

Two batteries are located within the instrument. Both are 1.5 volt cells, No. 2, D size, held in place with a spring clip. To remove the batteries, open the unit as described above and merely grasp both ends of the battery and pull in an outwardly direction. When replacing, be sure to observe battery polarity as shown in figure 5.

PARTS REPLACEMENT

All the components of the Model 650 have been engineered for many years of useful life. However, there are conditions under which parts may become damaged or faulty and require replacement. Refer to the circuit diagram in figure 6 to help identify and locate any suspected part.

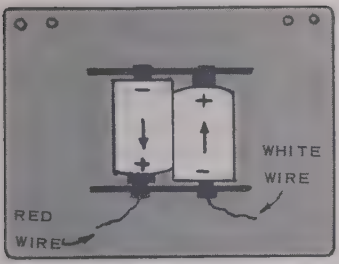


FIGURE 5 – REAR VIEW SKETCH OF MODEL 650 SHOWING BATTERY PLACEMENT

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R1	Resistor, 523 K ohms, 1%, ½w.	1–118155
R2	Resistor, 104.6 K ohms, 1%, ½ w.	1–117949
R3	Resistor, 20.92 K ohms, 1%, ½ w.	1–117944
R4	Resistor, 10 K ohms, 10%, ½w.	1–111671
R5	Resistor, potentiometer, 1.2 megohm, ±20%, (includes S4)	1–118366
R6	Resistor, 4.8 K ohms, 1%, ½w.	1–118157
R7	Resistor, 210 ohms, 1%, ½ w.	1–117946
R8	Resistor, 10.5 ohms, 1%, ½ w.	1–117948
R9	Resistor, 47 ohms, 20%, ½ w.	1–113921

Reference Symbol	Description	Simpson Part No.
R10	Resistor, potentiometer, 100 ohms, 30%, ½ w.	1–117958
R11	Resistor, 1.43 K ohms, 1%, ½w.	1–117945
R12	Resistor, potentiometer, 100 ohms, 35%, 1/10 w.	1–117960
R13	Resistor, 127 ohms, 1%, ½ w.	1–117947
R14	Resistor, 910 K, ±5%, ½ w.	1–118365
S1	Switch, rotary, BETA	1–117954
S2	Switch, rotary, FUNCTION	1–117955
S3	Switch, slide, 260/650	1–118102
S4	SPDT push-pull switch (part of R5)	---
	Transistor Test Socket	1–117957
	Plug, Banana, Special	1–118071
	Battery, 1.5V, "D" type	1–111798
	Knobs, BETA or FUNCTION switch	1–115546
	Knob, 260/650 switch	1–115658
	Test Lead Assembly	7545
	Instruction Manual	1–117919

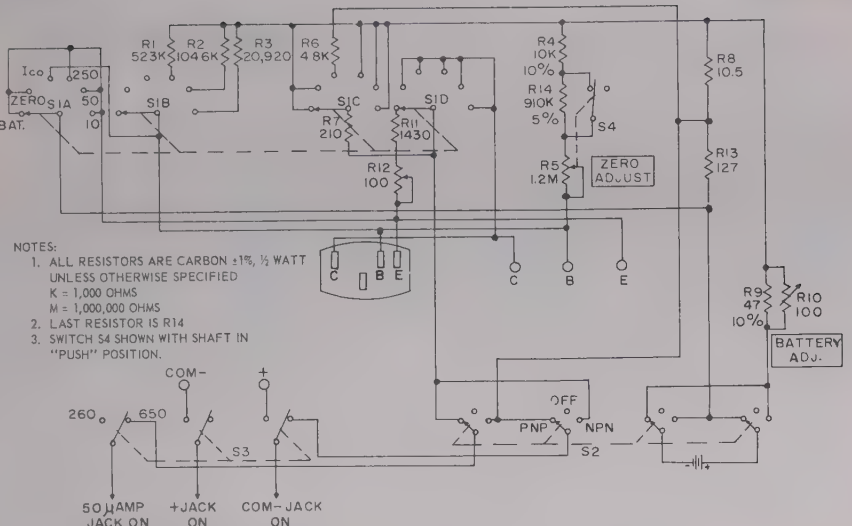


FIGURE 6 – SCHEMATIC DIAGRAM

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

**Arizona, Phoenix — Area Code 602
Metercraft Inc. — CRestwood 9-6249
3308 N. 24th St.
States: Arizona

California, San Diego — Area Code 714
Metermaster/San Diego, Inc. — 276-5202
5049 Weeks Avenue
San Diego Area

California, Los Angeles — Area Code 213
Quality Electric Company — ADams 2-4201
3700 South Broadway
States: So. California below Fresno and Arizona

California, San Francisco — Area Code 415
Pacific Electrical Instrument Lab. — Garfield 1-7185
111 Main Street
States: No. California above Fresno and Nevada

**Canada — Area Code 519
Bach-Simpson Ltd. — GLadstone 1-9490
1255 Brydges Street
P.O. Box 484
London, Ontario Canada

Colorado, Denver — Area Code 303
Meter-Master Instrument Service — 934-4601
2145 S. Kalamath Street — 934-4069
States: Wyoming, Colo., and New Mexico

Connecticut, New Haven — Area Code 203
Kaufman Instrument Labs Inc. — SPruce 6-7201
810 Dixwell Avenue
States: Connecticut

Florida, Orlando — Area Code 305
Electro Tech Inc. — GArden 3-5589
Florida Division
307-27th Street
States: Florida

Georgia, Atlanta — Area Code 404
Electro-Tech Inc. — 758-7205
690 Murphy Ave. S.W.
States: Alabama, Georgia and Tenn.

**Illinois, Chicago — Area Code 312
Simpson Electric Company — EStebrook 9-1121
5200 W. Kinzie Street

*Illinois, Chicago — Area Code 312
Pacific Indicator Company — COlumbus 1-1330
5217 W. Madison Street
States: Chicago, Wisconsin and Indiana

**Kansas, Shawnee Mission — Area Code 913
Sturz Instrument Co. — SKyline 1-4711
4705 Mission Road
States: Kansas

Louisiana, New Orleans — Area Code 504
Industrial Instrument Works — TWinbrook 5-5621
3328 Magazine Street
States: Arkansas, Mississippi and Louisiana

Massachusetts, Cambridge — Area Code 617
Alvin S. Mancib — UNiversity 4-2494
363 Walden Street
States: Vermont, New Hampshire, Massachusetts
Rhode Island and Maine

Michigan, Detroit — Area Code 313
Ram Meter Inc. — LIncoln 7-1000
1100 Hilton Road Ferndale
States: Michigan

Minnesota, Minneapolis — Area Code 612
Instrumentation Services Inc. — JA 1-8803
917 Plymouth Avenue N.
States: Minnesota, North and South Dakota

Missouri, St. Louis — Area Code 314
Scherrer Instruments — FOrest 7-9800
5449 Delmar Blvd.
States: Illinois below Peoria, Iowa, Missouri

New Jersey, Riverdale — Area Code 609
A & M Instrument Service, Inc. — MArket 4-7757
11 Hamburg Turnpike
States: N. Jersey

**New Mexico, Albuquerque Western Instrument Lab. Inc. 1816 Lomas Blvd. NW States: New Mexico	Area Code 505 243-3693
New York, Buffalo Electrical Instrument Labs. 932 Hertel Avenue States: New York State Except Met. New York	Area Code 716 EXport 2-2726
New York, Great Neck, Long Island Simpson Instrument Service Corp. 130 Cutter Mill Road States: Met. New York	Area Code 212 Murray Hill 3-0674 Area Code 516 Hunter 2-3103
New York, Long Island City A & M Instrument Inc. 48-01 31st Avenue States: Met. New York	Area Code 212 RAvenswood 6-4343
**New York, Syracuse Syracuse Instrument Lab. 4895 South Avenue Box 96	Area Code 315 HYatt 2-1651
**New York, Vestal Compton Industries Inc. 333 Vestal Parkway East P.O. Box 351 States: Up-State New York	Area Code 607 PI 8-3349
North Carolina, Charlotte Electro-Tech Inc. 3107 Cullman Avenue (Carolina Division) States: North and South Carolina	Area Code 704 333-0326
Ohio, Cleveland Weschler Electric Company 4250 W. 130th Street States: Ohio and Kentucky	Area Code 216 CLearwater 1-4609
**Ohio, Cleveland Pioneer Electronic Supply Div. of Pioneer Standard Electronic Corp. 5403 Prospect Avenue	Area Code 216 432-0010

**Dayton, Ohio — Area Code 513
SREPCO Electronics Div. of — BAldwin 4-3871
Pioneer Standard Electronic Corp.
314 Leo Street

**Oklahoma, Tulsa — Area Code 918
Tri-State Instrument Lab. — WE 6-0489
3244 East 15th Street
States: Oklahoma

**Oregon, Portland — Area Code 503
The Instrument Laboratory — BElmont 4-6683
1910 N. Killingsworth St.
States: Oregon

Pennsylvania, Philadelphia — Area Code 215
Sunshine Scientific Instrument — ORchard 3-5600
1810 Grant Avenue
States: Penn., Md., New Jersey below Trenton, Delaware

**Texas, Dallas — Area Code 214
Ultra Instrument Laboratories — TAylor 6-6395
3515 Swiss Avenue, Suite 117 — 6-6396
States: Oklahoma, Texas

Utah, Salt Lake City — Area Code 801
Stabro Laboratories, Inc. — IN 7-8011
23 Kensington Avenue
States: Utah, Southern Idaho

Virginia, Falls Church — Area Code 703
United Instrument Lab. Inc. — JEfferson 2-4123
102 Jefferson St.
States: West Virginia, Virginia, Wash. D.C.

Washington, Seattle — Area Code 206
The Instrument Lab. Inc. — ATwater 3-5850
934 Elliott Avenue West
States: Oregon, Washington
Idaho and Montana

* Parts Depots only; no repairs.
** Repair Stations only - no resale of parts.
(All other stations repair instruments and sell repair parts)
*** Parts Sales - Texas, Oklahoma
Repair -- Texas only.

Add-A-Tester Adapter

Model 651
DC VTVM

Designed for

TRANSISTOR CIRCUITRY
and GENERAL (AGC, Power
Supplies, etc.) SERVICING.

Laboratory Type DC
Coverage (10 ranges)

★

NET PRICE

$32.95

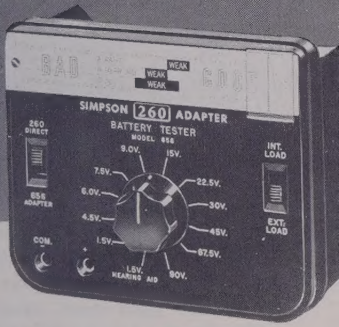
★

SIMPSON ELECTRIC COMPANY

5200 West Kinzie Street • Chicago 44, Illinois

Add-A-Tester Adapter

Model 656 Battery Tester



Designed for

TRANSISTOR RADIO SERVICING

AC/DC RADIO SERVICING

HEARING AID SERVICING

★

NET PRICE

$19.95

★

SIMPSON ELECTRIC COMPANY

5200 West Kinzie Street • Chicago 44, Illinois

Add-A-Tester Adapter

Model 655

Microvolt Attenuator

Designed for

AUDIO CIRCUITRY DESIGN and
SERVICING, DC CIRCUITRY, and
INDUSTRIAL SERVICING and DESIGN

★

NET PRICE

$18.95

★

SIMPSON ELECTRIC COMPANY

5200 West Kinzie Street • Chicago 44, Illinois

WARRANTY

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

Quality is the indispensable component of every Simpson instrument . . . . . .